Fabio Acerbi, "Two approaches to foundations in Greek mathematics:Apollonius and Geminus". Science in Context 23 (2010), 151–186

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Published in:
MathSciNet

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Høyrup, J. (2012). Fabio Acerbi, "Two approaches to foundations in Greek mathematics:Apollonius and Geminus". Science in Context 23 (2010), 151–186. *MathSciNet*, (MR2647353).

MR2647353 (2012f:01004) 01A20

Acerbi, Fabio

Two approaches to foundations in Greek mathematics: Apollonius and Geminus. (English summary)

Sci. Context **23** (2010), *no. 2,* 151–186.1474-0664

The present article is presented as a sequel to a previous one [F. Acerbi, Sci. Context **23** (2010), no. 1, 1–37; MR2594735 (2011b:01001)] on homeomeric lines (that is, lines of which any two equal parts can be made to coincide by superposition—the straight line, the circle, the cylindrical helix, and no others) in Greek mathematics. It combines the traces of the discussions of mathematical principles to which these lines gave rise with other evidence in order to portray metamathematical attitudes among Greek mathematicians (to be distinguished from those of the philosophers).

The protagonists are Apollonius and Geminus (1st c. BCE, somehow connected to Stoicism and somehow to Posidonius). The main difficulty encountered by earlier workers and confronted by Acerbi is that the pertinent works of the two authors are only known indirectly, and both mainly from Proclus's commentary to *Elements I*. Proclus sometimes cites their points of view with explicit reference, and sometimes uses formulations that are so close to what is cited explicitly that common origin can be surmised—but always, of course, within his own context, and probably often indirectly.

Acerbi lists a number of "foundational issues" that were also discussed by other mathematicians (pp. 155–158): the nature of the principles; their adequacy; and their importance. Insofar as Apollonius is concerned, Acerbi states "that he is simply the first, and by and large the only, Greek mathematician who did (basic and advanced) mathematics as a consequence of reflecting on mathematics" (p. 159). His stance, as extracted from a large number of passages from Proclus (but also from other authors), is summarized (pp. 170–171) as "a particular concern for deductive economy, by reduction of the number of undefined notions and basic proposition employed" (not least drawing on the principle of superposition), and "the idea that an already full-fledged mathematical theory gains in being inserted in a larger *system*". Geminus's foundational aims, as they can be deduced from acknowledged and unacknowledged but plausible borrowings from his lost encyclopedic treatise on the mathematical sciences (pp. 172–181), encompass the classification of mathematical disciplines and of the various kinds of mathematical objects (lines, angles, surfaces, figures, and plane figures)—somehow a parallel to the themes of Sextus Empiricus's treatment of mathematics, but with the aim of stabilizing, not undermining, the field. The last part of the article takes up the foundational discussions of both that were occasioned by homeomery.

Reviewed by *Jens Høyrup*